

Patients who had more severe COVID-19 may be the best donors for convalescent plasma therapy

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Sex, age, and severity of disease may be useful in identifying COVID-19 survivors who are likely to have high levels of antibodies that can protect

against the disease, according to a new study co-led by researchers at Johns Hopkins Bloomberg School of Public Health.

The findings suggest that older males who have recovered from COVID-19 after having been hospitalized are strong candidates for donating plasma for treating COVID-19 patients. Doctors have been using infusions of plasma—the part of blood that contains [antibodies](#)—from recovered COVID-19 patients to treat COVID-19 patients and also as a possible prophylaxis to prevent COVID-19.

Doctors have used convalescent plasma to treat patients or immunize persons at high risk of virus exposure during outbreaks of measles, mumps, polio, Ebola, and even the 1918 pandemic flu.

Clinical trials of convalescent plasma treatment against COVID-19 are ongoing, and doctors until now haven't had guidance for selecting COVID-19 survivors who are likeliest to have strong antibody responses.

"We propose that sex, age, and severity of disease should be used to guide the selection of donors for convalescent plasma transfer studies because we found that these were significant patient characteristics that not only predicted the amount of antibody but the quality of that antibody," says study lead author Sabra Klein, Ph.D., professor in the Bloomberg School's Department of Molecular Microbiology and Immunology.

The study, published October 19 in the *Journal of Clinical Investigation*, was a collaboration with several other research groups including that of Arturo Casadevall, MD, Ph.D., Bloomberg Distinguished Professor and chair of the Department of Molecular Microbiology and Immunology, and co-corresponding author Aaron Tobian, MD, Ph.D., professor in the Department of Pathology and director of the Transfusion Medicine Division at the Johns Hopkins School of Medicine.

For their study, the researchers tested the blood of 126 COVID-19 survivors and found high variability in their antibody levels and their antibodies' ability to neutralize the COVID-19-causing [coronavirus](#), SARS-CoV-2. Three factors were associated with stronger antibody responses: having been sick enough with COVID-19 to be hospitalized, being older, and being male.

Initial studies of recovered COVID-19 patients have revealed a significant variability in their antibody responses to the virus—some survivors having very weak responses that would almost certainly be ineffective in helping new patients. The researchers in the new study looked for factors that might help explain some of that variability and guide clinicians to the patients most likely to have high levels of SARS-CoV-2 neutralizing antibodies.

The researchers examined samples of plasma from the 126 recovered patients using several tests. These included tests of the plasma's ability in [cell cultures](#) to neutralize cell-to-cell infection with SARS-CoV-2, as well as commercial tests for levels of antibodies to the coronavirus's spike protein—the protein that studs the surface of coronavirus particles and allows the virus to attach to and infiltrate human cells.

Consistent with several prior studies, the researchers found considerable variability among the subjects in their spike-protein antibody levels and plasma coronavirus-neutralization potency. But on average, the plasma of survivors who had been hospitalized with COVID-19 had markedly more anti-spike protein antibodies and neutralized the virus more effectively—suggesting that disease severity prompts a stronger immune response.

"We know that the magnitude of antibody responses correlates with disease severity in other infectious diseases, such as active tuberculosis," Klein says.

Older age and male sex, which prior studies in both China and Europe have shown are associated with more severe COVID-19, were also associated with stronger antibody responses, though these links were weaker than for hospitalization status.

As part of their study, the researchers also tested study participants with commercial test kits and found that recovered COVID-19 patients who have strong neutralizing antibody responses also are very likely to have high levels of coronavirus anti-spike antibodies. This suggests that this type of test kit, which is relatively inexpensive, might be a good tool for identifying suitable [plasma](#) donors for clinical trials and treatments.

Provided by Johns Hopkins University Bloomberg School of Public Health

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